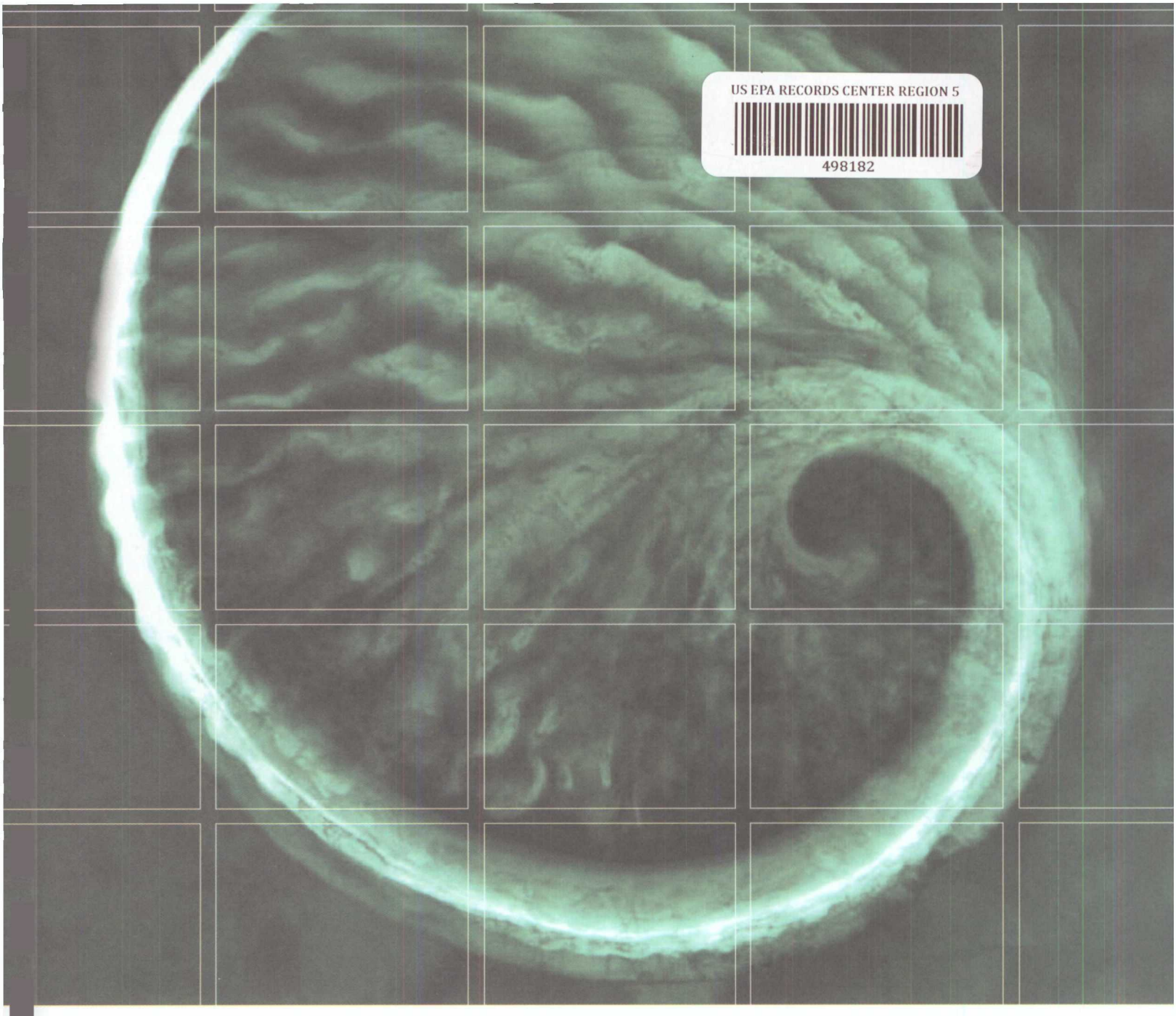

Construction Quality Assurance Plan

Greiner's Lagoon – Fremont, Ohio

June 2005

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Construction Quality Assurance Plan: *Griener's Lagoon- Fremont, Ohio*

June 2005

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1.0 INTRODUCTION

This Construction Quality Assurance (CQA) Plan was prepared in accordance with the Approved Work Plan for the Greiner's Lagoon Site, (herein Site) and shall be implemented under the direction of the CQA Officer. The contents of this CQA Plan will be adhered to, to ensure the Removal Action (RA) is properly implemented.

1.2 GENERAL

Quality control during the construction of Comprehension Environmental Response, Compensation and Liability Act (CERCLA) Remedial facilities is critical to the long-term performance of the remedy. The RA consists of grading of the Greiner's Lagoon Site along with the addition of a topsoil vegetative layer and the planting of grass and Populus Trees to control infiltration and movement of groundwater at the site.

This document outlines the minimum inspection, testing, and documentation standards that shall be followed by the CQA Officer in order to certify that the construction meets the requirements of the Administrative Order on Consent (AOC), and the design drawings and specifications.

1.3 DEFINITIONS

Quality Assurance (QA): The means and actions employed by the Owner to assure conformity of the design, manufacture, and installation with the quality assurance plan.

Construction Quality Assurance (CQA) Officer: CQA Officer shall mean a licensed Professional Engineer in the State of Ohio, or his duly appointed and qualified representative. The CQA Officer will be chosen by the Owner and be responsible for performing the quality assurance monitoring, testing, and certification. The CQA Officer shall be the party responsible for overall certification that the construction was in conformance with the Removal Design/Removal Action (RD/RA) Work Plan and these Documents.

QA Monitor: The CQA Officer or his duly appointed representative who is responsible for the day-to-day functions of the CQA Officer.

Surveyor: The person appointed by the CQA Officer to perform necessary surveying to confirm that grades and locations conform to the design plans.

QA Plan: The written document describing the required activities of the CQA Officer.

Owner: The Owner or operator of the site in which construction is taking place.

Design Engineer: The firm responsible for preparation of the design and specifications of the construction project.

Construction Contractor: Firm or person retained by the Owner to actually perform construction activities at the site. This will include any subcontractors retained by the Construction Contractor.

Manufacturer: Party responsible for the manufacturing of items to be installed at the site.

Installer: Party responsible for the installation of manufactured products at the site. Roles of the Installer and Construction Contractor may overlap. The installer may be a subcontractor of the Construction Contractor, or a firm or individual retained by the Owner to install a specific item during construction.

Third Party: Independent from the designer, owner, construction contractor, manufacturer, or installer.

2.0 QUALITY ASSURANCE PERSONNEL

2.1 CONSTRUCTION QUALITY ASSURANCE OFFICER

2.1.1 General

The CQA Officer is a licensed Professional Engineer in the State of Ohio, selected by the Owner to be responsible for the implementation of the QA Plan and certification that construction is in conformance with this plan, the engineering plans, and the requirements of the AOC.

2.1.2 Qualifications

The CQA Officer shall be a Professional Engineer Licensed in the State of Ohio and experienced in the applicable fields of civil, geotechnical, and environmental engineering and earthwork.

2.1.3 Responsibilities

The CQA Officer shall review the design and specifications of the Greiner's Lagoon Remedial Design (RD) to determine if there are errors or details that may cause construction problems or failure of the components that the CQA Officer must certify. Any errors or potential problems due to design shall be brought to the attention of the Owner and the Design Engineer. Any disputes over the correctness of the design or specifications shall be resolved by the Owner.

The CQA Officer shall be in charge of all CQA personnel and personally inspect the site periodically and review daily logs, test data and other documentation in order to keep current with the construction activities. The CQA Officer shall be responsible for the approval of materials being used for construction. The CQA Officer shall be responsible for the selection of third party material testing laboratories. The CQA Officer shall be responsible for the certification of construction.

2.2 QUALITY ASSURANCE MONITORING

2.2.1 General

The QA Monitor shall be the person or persons responsible for the daily monitoring of construction activities falling under this QA Plan. The QA

Monitor shall be a duly appointed representative of the CQA Officer and shall perform duties as mandated by the CQA Officer and this QA Plan.

2.2.2 *Qualifications*

The QA Monitor shall have knowledge of the construction and testing techniques employed for the stage of construction being monitored. As applicable, the QA Monitor shall be proficient and certified in the use of field testing methods and monitoring equipment.

2.2.3 *Responsiblities*

The QA Monitor shall be at the construction site whenever active construction of any of the components that fall under this Plan is being performed and shall maintain a daily log of site activities. However, at the discretion of the CQA Officer, part-time QA monitoring may be allowed. Copies of the daily log shall be submitted to the CQA Officer at least once a week.

The QA Monitor shall monitor all sampling and testing performed by the Construction Contractor in conjunction with the items that fall under this Plan. The QA Monitor shall be responsible for the sampling and testing required of the CQA Officer as described in the QA Plan.

The QA Monitor shall be responsible for documenting all testing mandated by the QA Plan and for reporting any non-conformance of the construction to the CQA Officer, the Construction Contractor and the Owner or his authorized representative.

The QA Monitor shall have the authority to stop applicable construction activities until faulty construction is brought into conformance with the design specifications. The QA Monitor shall observe and document repair operations.

3.0 DOCUMENATION

3.1 GENERAL

All documentation shall be prepared in accordance with this QA Plan. Two (2) copies of all documentation must be completed. The QA Monitor shall keep original copies in his personal file. A separate set shall be submitted to the CQA Officer at least once a week.

3.2 SAMPLE DOCUMENTATION

All samples shall be labeled with the following information:

- project name;
- project location;
- sample identification number;
- sampling date;
- sampling time; and
- sample type.

All samples shall be logged onto a sample log-in sheet. In addition to the information required on the sample label, the log-in sheet shall contain:

- sample identification number;
- sample description;
- tests to be performed on the sample;
- testing facility name;
- date test results are due;
- test status; and
- plan sheet designations on which the sample is located or sample location by site coordinate system.

All sample locations shall be referenced to the site coordinate system or shown on a copy of the construction site plan as described in Section 3.8.

3.3 TEST DOCUMENATION

At a minimum, the following information shall be given on test result sheets:

- sample identification number;
- date of sampling;

- date of testing;
- test results;
- status of sample; and
- comments.

3.4 *DENSITY/MOISTURE CONTENT DOCUMENATION*

At a minimum, the following information shall be given on the documentation for nuclear density/moisture content tests:

- test designation;
- test location (plan coordinates and elevation);
- date;
- calibration density count;
- calibration moisture content count;
- measured wet density;
- measured dry density;
- measured moisture content;
- optimum dry density;
- optimum moisture content;
- percent compaction;
- test status (pass or not pass);
- depth of measurement; and
- initials of tester.

All sample locations shall be referenced to the site coordinate system or be shown on a construction site plan as described in Section 3.8.

3.5 *INSPECTION DOCUMENTATION*

Visual inspection required for approval of a constructed component of the RA shall be documented. At a minimum, the following information shall be documented:

- inspector's name;
- date;
- time;
- component inspected;
- deficiencies in construction;
- corrective action taken;
- general comments; and
- photos taken during inspection.

3.6 *DAILY LOGS*

The QA Monitor shall complete a daily field report of each day's site construction activities. At a minimum, each daily report shall contain the following information:

- date;
- QA Monitor's name;
- weather conditions;
- construction activities including equipment used and quantities of materials placed;
- list of photographs taken;
- list of samples taken;
- list of tests performed;
- list of test results received; and
- record of all forms filled out during the day.

3.7 *PHOTOGRAPHS AND VIDEO TAPES*

Photographs or videotapes may be taken in order to aid in documenting site activities, inspections, sampling and testing. Photographs and videotapes shall not be used as sole documentation of activities.

The following information shall be written on the back of each photograph or on a separate log of each electronic photo:

- photograph number;
- date and approximate time of photograph;
- location and brief description of the photo subject; and
- purpose of the photo.

The same information shall be included on videotapes by means of labeling and/or audio description during taping.

3.8 *CONSTRUCTION PLANS*

Site construction plans shall be utilized to show the locations of samples taken, tests performed, and defects found during construction inspections. The construction plans shall be at an appropriate scale in order to show the recorded information clearly. Where possible dimensions to known monuments or coordinates shall be shown.

Sample or test locations shall be clearly labeled with the sample or test number. Plans shall indicate previously constructed areas and areas under current construction.

4.0 SUBGRADE CONSTRUCTION

4.1 DESCRIPTION

The subgrade is defined as the existing soil or soil fill which acts as the base over which the Phytoremediation System will be constructed as shown in Figure 1.

4.2 MATERIAL APPROVAL

4.2.1 General

Materials for the subgrade shall be approved by the CQA Officer. Approval shall be based on conformance of the on-site materials or borrow source properties with the design specifications and the QA Plan.

4.2.2 Moisture Content – Density Relationship Tests

Modified Proctor (ASTM D1557) tests shall be completed for all on-site materials or borrow soil at a minimum rate of 1 test per 5,000 cubic yards of material placed.

One-point Proctor tests (ASTM D5084) may be performed to meet the requirements of the above paragraph provided full moisture-density curves have been defined for that soil type. The QA Monitor may also mandate additional one-point Proctor tests in order to verify soil types. Soils in which the one-point Proctor does not fall on a defined moisture-density curve shall be retested with a full modified Proctor test (D1557 with 4 data points).

4.3 CONSTRUCTION APPROVAL

4.3.1 Pre-Construction Activities

Before the placement of soil fill begins, a preconstruction meeting shall be held. At a minimum, the CQA Officer, the Construction Contractor, and a representative of the Owner shall be present. The purpose of the meeting will be to establish protocol for communication and inform the Construction Contractor of the responsibilities of the CQA Officer.

4.3.2 *Existing Subgrade Approval*

The subgrade shall provide a firm foundation for the construction of the Phytoremediation System. The subgrade shall be free of frozen material, debris, large rocks, excess organic material and abrupt changes in grade.

To insure that a suitable subgrade for the construction of the Phytoremediation System exists, the QA monitor shall visually examine the surface of the subgrade for the presence of unsuitable materials. Unsuitable material such as debris, large rocks, excess organic material shall be removed and replaced with General Fill as specified in Section 5.0.

The subgrade shall be protected from detrimental climatic effects during construction. This may include: 1) removing all ice and snow during winter construction before placing successive lifts and not using frozen soil in any part of the system, 2) recompacting any soil lift or subgrade surface that has had its integrity adversely affected by the weather, and 3) ensuring that the subgrade is not subjected to significant desiccation.

5.0 GENERAL FILL

5.1 DESCRIPTION

The general fill is defined as the soil fill which is placed over the subgrade and acts as the base over which the Vegetative Growth Layer (i.e.--topsoil) will be constructed as shown in Figure 1.

5.2 *General Fill Placement Approval*

The QA Monitor shall observe the placement of the soil fill to verify that construction methods such as equipment type, lift thickness, compactive effort, etc., are performed in accordance with the specifications and this QA Plan.

Borrow material shall be visually inspected to ensure that it is free of debris, rocks, and excess organic material. No material shall be placed over the subgrade until the CQA Officer has approved it. Approval shall be based on conformance with the design specifications and this QA Plan.

Placement and compaction of the soil fill shall be performed in 6-inch lifts and in a manner that does not damage the pre-existing subgrade. Each lift shall be integrated into the previous lift by techniques such as scarifying each lift and by using compaction equipment that is capable of penetrating the thickness of each compacted lift.

The surveyor shall verify that the soil has been placed equal to or no greater than 0.2-feet above the grades and elevations specified in the design. The survey shall be made on a maximum of a 100-foot grid supplemented with additional points at grade breaks.

5.3 *Compacted Soil Fill Testing*

Soil lifts shall be compacted to a density of 90 percent or greater of the maximum dry density at or above the optimum moisture content as determined by a Modified Proctor (ASTM D1557) Moisture Content-Density Relationship Test. Each lift of the subgrade shall be tested by the CQA Officer at a minimum rate of 1 test per acre covered by the lift, or a minimum of three (3) tests per day of construction or lift of soil placed for density by nuclear methods (ASTM D2922 & D3017).

Testing locations shall be randomly selected to insure an even distribution of test locations across the site. Additional density tests shall be performed as necessary to insure that uniform compaction has been achieved. Locations shall be located by elevation and coordinate.

Successive, adjacent lifts shall be tested at separate locations than the underlying lift.

Density tests performed by the Construction Contractor may be used to fulfill the testing requirements of this part. Copies of all testing performed by the Construction Contractor shall be obtained and reviewed by the QA Monitor. Any discrepancies between the results obtained by the Earthwork Contractor and those obtained by the QA Monitor shall be resolved as outlined in Section 4.3.5.

5.4 *Contingency for Improper Compaction*

Should density reveal lifts that do not conform to the requirements of the construction documents, additional density tests may be performed in order to determine the extent of construction that does not meet the specifications.

If failing areas cannot be compacted to the specified density at the correct water content, compactive effort, etc, the material shall be reworked in accordance with the specifications until it meets the requirements.

5.5 *Conformance To Line and Grade*

The surveyor shall verify the elevations of the subgrade. Elevations shall be within 0.2 feet of approved plans. The survey shall be made on a maximum of a 100-foot grid supplemented with additional points at grade breaks, leachate sumps, and collection line locations.

6.0 VEGATATIVE GROWTH LAYER

6.1 GENERAL

The Phytoremediation System incorporates a one foot vegetative growth layer (topsoil) capable of sustaining native plant growth as shown in Figure 1.

6.2 MATERIAL APPROVAL

The CQA Officer shall approve the borrow source for the vegetative growth layer before being used for construction. Approval shall be based on conformance with the design specifications and this QA Plan.

The QA monitor shall inspect the soil of the vegetative growth soil as it is delivered and spread to ensure that is free of large rocks, branches, or any other material that may damage the underlying final cover system layers.

The vegetative growth material shall be tested for organic content (ASTM D2974) at a minimum rate of 1 test per 10,000 cubic yards. All vegetative growth material used in the construction of the final cover shall contain at least 1.25% organic material.

6.3 CONSTRUCTION APPROVAL

No vegetative growth material shall be installed until the subgrade has been approved by the CQA Officer.

The QA Monitor shall monitor the placement and compaction of the vegetative layer to ensure that the subgrade is not damaged.

The QA Monitor shall verify that the proper thickness of the soil has been placed within ±0.2 feet of the elevations and grades shown by the plans. Determination of the thickness of the layer shall be performed in a manner that does not harm the underlying components.

6.4 *PHYTOREMEDIATION COVER*

The final Phytoremediation cover materials shall be installed as shown on the detail plans and as specified in Section 02930 Trees and Grasses.

6.4.1 *Grasses*

The QA Monitor shall monitor the seeding of the final cover to ensure that coverage is adequate and even and the requirements of the plans and specifications have been met.

The QA monitor shall verify that all areas to be seeded are covered at a uniform rate with the approved grass seed mixture as specified for use based on period of planting.

Samples of seed along with certified quality analyses shall be retained by the QA monitor.

6.4.2 *Trees*

The QA monitor shall monitor the installation of the Populus Trees as specified in Section 02930.

The contractor shall provide documentation of species and growth history for trees to be installed prior to placement.

Following tree placement the QA monitor shall verify the live status of all trees. Trees found to be not viable shall be marked for replacement by the contractor.

Trees that are found to be not viable shall be replanted as needed.

7.0 *DRAINAGE CULVERT*

The precast drainage culvert shall be installed as shown on the detail plans.

The contractor shall submit specifications for the precast concrete culvert, inlet risers and cast iron appurtenances to the ENGINEER for approval prior to installation. The ENGINEER shall approve these products before they are installed on site.

The QA monitor shall visually monitor the installation of the culvert as per ODOT specifications.

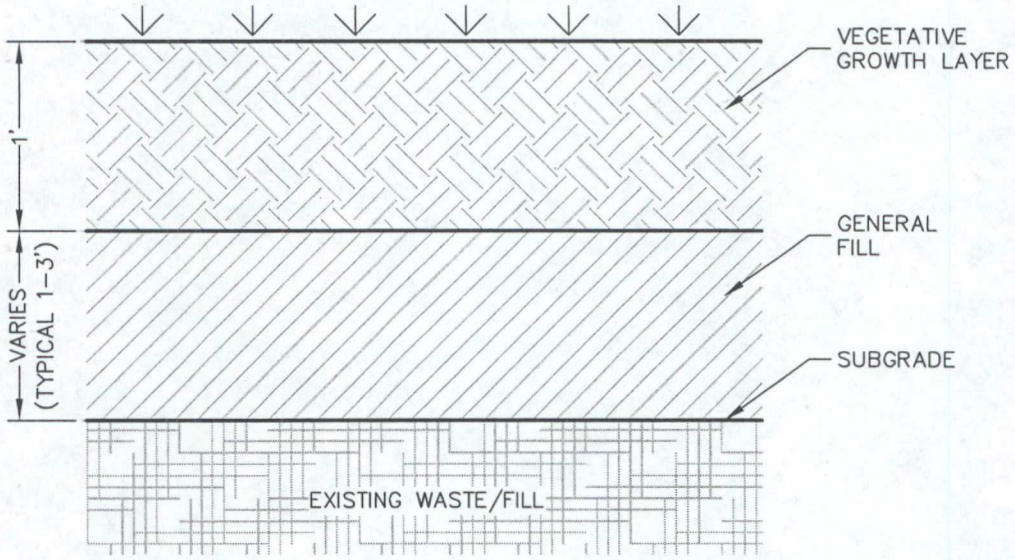
The QA monitor shall verify that the final grade of the culvert is as shown on the detail plans and that the inverts of the culvert and inlets are within 0.05 feet of those shown on the detail plans following installation.

8.0 CERTIFICATION

Upon completion of the Phytoremediation System, the QA Monitor shall submit to the CQA Officer a certification statement referencing all tests, samples, inspections, and other reporting documents prepared during the construction of the liner or final cover system. The CQA Officer shall then prepare a report that certifies that the phytoremediation system was constructed in accordance with this CQA Plan, and the Engineering Plans approved by USEPA. This report shall contain but is not limited to the following information:

- a daily activity log ;
- records of the natural subgrade;
- records of the subgrade fill;
- final elevations as documented on as-built plans ;
- diagrams that show the location of all tests;
- any deviations of the construction from the approved Construction Plans; and
- a statement attesting to the accuracy and completeness of the certification report

TYPICAL CROSS SECTION



REVISIONS TO BE MADE ON THE CADD FILE ONLY

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ERM®		CHK'D JJ
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	Environmental Resources Management	FIGURE 1

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